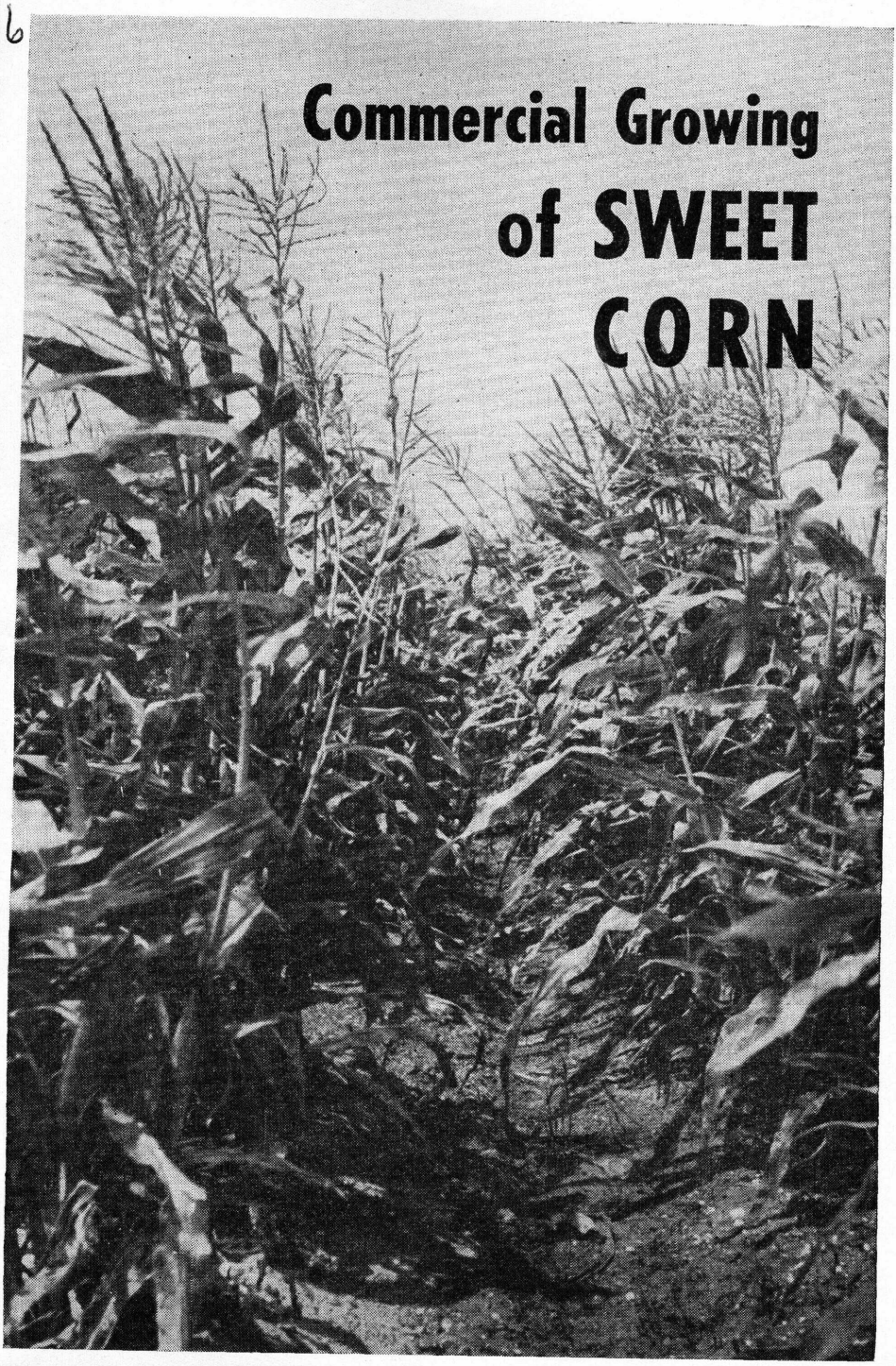
Commercial Growing of SWEET CORN



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SWEET CORN grown for canning and freezing has ranged from about 250,000 to 500,000 acres from 1935 to 1951. That grown for fresh market has increased rapidly since World War II to about 125,000 acres. Improved varieties, methods of insect control, and refrigerated handling and shipping facilities have contributed greatly to this expanded production of sweet corn for market, especially in the South.

This bulletin lists varieties, describes conditions and methods suitable for growing sweet corn, and tells how to protect the crop from various pests and diseases. Special attention is given to growing the crop for market, although information is included that applies to growing it for canning or freezing.

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COMMERCIAL GROWING OF SWEET CORN

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Contents

SWEET CORN for market was a minor or local crop before World War II, but after the war it developed and expanded rapidly as a crop. Most growers for market operate more independently, with less organized guidance and supervision, than growers for processing. Requirements for good growth of sweet corn are the same whether for market or for processing.

Practices and requirements after harvesting, however, are quite different for the two uses of the crop. Furthermore, as production for market is expanding in the South, where conditions have been unfavorable for the establishment of a processing industry, some practices are necessarily different from those of the old-established areas of production for processing or for market in the North.

The growing of sweet corn for processing, however, has been a large and widespread industry in which rapid technical advances have been made. Canning and freezing companies that grow their own sweet corn and furnish guidance for farmers who grow it under contract for them have now become highly proficient. Many conduct research under their own local conditions, and most of them become quickly familiar with the latest research affecting their business through

direct contact with numerous research workers. Because of the way the sweet corn processing industry is now organized and the direct channels of technical information available to it, there is little need for a Department publication especially for the growers of sweet corn for processing. Therefore, this bulletin is designed primarily for the market grower, but it does contain basic information that applies to sweet corn culture for either market or processing.

SWEET CORN AS FOOD

Sweet corn doubtless was known to the American Indians long before the discovery of America. There is, however, no evidence that the Indians cultivated it as they cultivated the starchy corns. Although it was found by colonists in the eastern United States during Revolutionary times, there was no particular interest in it until about 1850, when a few varieties were first listed by American seedsmen. Its culture and production in America have increased rather steadily ever since. Sweet corn is still, however, mainly a North American food; it is little known or appreciated in most other lands.

Sweet corn is a good source of phosphorus and of thiamine in the diet and yellow varieties are a fair source of vitamin A, but, among vegetable crops, it is not outstanding for its food value in any particular respect. In energy value the edible kernels are roughly equivalent to potatoes. As purchased in the husk, however, the large amount of waste results in a rather low edible proportion, giving, pound for pound, only about half the energy value of potatoes as purchased. This lack of outstanding food properties should not suggest by any means that sweet corn is an inferior food. On the contrary, it is one of our more nutritious vegetables that is universally popular in America because of its attractive flavor and suitability for preparation in a wide variety of dishes.

In terms of net human food produced per acre, sweet corn ranks lower than most other vegetables and many staple crops. It ranks high in production of food per man-hour of labor, however, because of its relatively low labor requirement, owing to its adaptability to almost entirely mechanized methods of culture and mechanized harvesting for canning or freezing.

NEW IMPORTANCE OF MARKET SWEET CORN

About 1910 to 1915 sweet corn growing in the United States for sale came to exceed 200,000 acres per year. Most was grown for canning. Since then the acreage for canning (or canning and freezing) has fluctuated violently, from only about 150,000 to more than 500,000 acres a year. Figures for market corn have been recorded for only a few States and only since about 1925. No accurate estimate of the acreage now grown for market can be made, but it is known to have increased enormously since 1940. In 1951 probably well over 125,000 acres was grown for marketing fresh.

Of the several reasons for this phenomenal increase in market sweet corn during the 1940's three have been most important: (1) The breeding of new hybrids suitable for culture in the South—both for local use and for shipment northward; (2) the availability of new

synthetic insecticides for control of corn earworm and other insects; and (3) the development of improved packing and shipping materials, equipment, and methods. Perhaps most outstanding among these has been the improvement and extension of precooling and the refrigeration facilities to reduce loss of eating quality of the corn before it can be delivered to the consumer.

As recently as 1940 some competent observers could see no great future for commercial sweet corn culture in the South. However, in Florida alone nearly 30,000 acres was grown during the 1949–50 crop season, having a farm value of more than $6,000,000. Sharp increases in acreage and production have occurred in other States, especially in the lower South.

These increases in market sweet corn production apparently have not affected the acreage grown for canning and freezing. With the purchasing power of the average consumer relatively good the production of sweet corn for processing has remained high. Sweet corn that is specially precooled, packed, and shipped long distances rapidly under refrigeration is necessarily somewhat more expensive than local sweet corn and some other vegetables. The demand has been good, however, because of the American consumer's delight in fresh corn on the cob that is of high quality.

CLIMATIC REQUIREMENTS

Temperature Effects on Growth and Yield

Sweet corn is essentially a warm-weather crop. It is not only easily killed by frost but may be seriously injured by prolonged temperatures several degrees above freezing. Germination and emergence of the seedlings are delayed, or entirely prevented, by soil temperatures much below 50° F. Few varieties can be grown satisfactorily where the 3-month midsummer mean temperature is below 65°. In Canada, however, some extremely small and quick-growing varieties have been developed that can be grown a little farther north than Edmonton, Alberta, where the June-to-August mean temperature is lower than 60°. Most of the acreage for processing lies in areas having June–July–August mean temperature between 65° and 75° in the eastern half of the country northward from Indianapolis and Baltimore. Where it is grown in the South or the West, it is planted at such time that it will be exposed to approximately those same mean temperatures, 65° and 75°, through most of the life of the crop.

Midsummer temperatures in the South and Southwest are often high enough to interfere with pollination, especially since the highest temperatures usually are accompanied by dry weather. Hot, dry winds may damage the pollen or the entire tassel so that little or no normal pollen is available to produce a set of seed. Varieties and hybrids differ in their tolerance to heat as well as to cool weather, making some varieties better for one region or season than for others.

Varietal descriptions usually include some indication of the number of days from planting to harvest. That figure is only an approximation for average conditions to which the variety is adapted. Development is more rapid at temperatures above average and is slower at cooler temperatures. For example, Golden Bantam is rated as an

80-day variety where it is usually grown, but in southern Canada and during cool seasons elsewhere it takes 90 to 100 days.

When successive plantings of a single variety are made at intervals, as the weather becomes warmer in spring, the later plantings develop faster than the early ones because they encounter more warm weather. Therefore, the range of harvest dates will be much shorter than the range of planting dates. When planted April 28, for example, 1 year, at Washington, D. C., Golden Bantam reached the best harvest stage in 99 days. Six later plantings at about 8-day intervals reached the same stage in 97, 92, 81, 80, 77, and 75 days. The seventh planting (June 17) reached harvest only 26 days later than the first one although it was planted 50 days later. Plantings made still later in the season ran into cooler weather, and the time to harvest then increased instead of decreasing.

Hot weather, especially in the South, has some indirect effects on sweet corn that are generally more harmful than the direct effects. In warm climates, for example, the corn earworm is much more serious than in cool climates. In the middle and southern parts of the country successively later plantings usually suffers increasingly serious damage from earworm, often to the extent that without use of insecticides the late plantings become virtually worthless. Since 1940, therefore, the development of new insecticides and methods of application have played a large part in the expansion of sweet corn culture in the South, even during the milder months of the year.

If the temperature is either much too cool or much too hot to bring a variety to the harvest stage somewhere near its typical time, the yield is likely to be impaired for one reason or another.

Temperature Effects on Quality

Contrary to former belief, the warm climate of the South does not cause sweet corn to develop any significantly lower sugar content in its kernels than can develop in a cooler climate. Hot weather does, however, cause the kernels to develop faster and to mature faster, so that they remain in prime condition for eating for a shorter time than they do when the weather is cool. Thus, in hot weather the ears pass the best stage quickly and there is more probability of harvesting ears that are too mature and, therefore, not of the highest quality.

Maturing consists largely of a change of sugar into starch, with resulting loss of sweetness; the kernels also become firmer, the seed coats become tougher, and there is a progressive increase in solids and decrease in water content. The rate of maturity approximately doubles for each 18° F. rise in temperature; it is about twice as fast at 72° as at 54°. This temperature effect on rate of development and maturity is relatively precise and definite. The temperature requirements of specific varieties can be determined from records of plant development and maturity at different field temperatures—plantings at different times and places. From suitable plant, time, and temperature data it is now possible to determine with remarkable accuracy what day a particular field should be harvested to obtain the particular degree of quality desired. Processing companies and other large growers use this method of predicting, a few days in advance, the harvest date to obtain the best quality. Because of the instruments

and comprehensive records and calculations that are required, growers of small acreages depend on less elaborate ways of judging when to harvest. (See p. 17.)

The effect of temperature on changes in quality of sweet corn after harvest are no less striking and predictable than before harvest. The kernels go on "maturing" after they are harvested. Therefore, effective cooling or refrigeration is essential immediately after harvest, especially in warm weather, if the corn is to be held more than a few hours before processing or use.

After harvest, not all of the sugar that is lost goes to form starch or other substances in the kernel. Much of it is lost by respiration. Respiration releases carbon dioxide, water, and heat. When corn is thrown into large piles or packed tight without adequate cooling, this heat of respiration raises the temperature of the corn, speeding up respiration and thus raising the temperature still more. Temperatures that will quickly develop under these conditions may be so high as to ruin the corn in a few hours. At 86° F. after harvest about half the sugar is lost in 24 hours. Losses are greater at higher temperature and less at lower temperature. That is why it is important to cool market corn immediately after it is harvested and keep it cool until it is to be prepared for the table. This effect of temperature explains, in part, why the northern part of the country is more favorable for processing sweet corn of high quality than is the southern part.

Water Requirements

In nonirrigated areas of the United States sweet corn is grown chiefly in areas having 20 inches or more of fairly well distributed rainfall from April through September, and an annual rainfall of 30 inches or more. The extensive sweet corn districts in southern Minnesota receive only 25 to 30 inches annual rainfall, but the rainfall for the 6 months of April through September averages 21 to 24 inches.

Unless the soil can retain a large supply of water sweet corn rather quickly suffers injury from rainless periods if they are of more than 2 weeks. Yield or quality, or both, may be reduced. In the so-called dry-land farming areas sweet corn is an uncertain crop, failing more or less completely in 7 or 8 years out of 25, and the yields vary extremely from year to year because of drought. An average seasonal rainfall of 10 to 12 inches or an annual rainfall of no more than 15 to 20 inches is clearly insufficient for profitable sweet corn crops year after year, even with the use of the best dry-land methods. Home gardeners in such areas, however, persistently plant sweet corn on the chance that rainfall above normal will occur and result in a good crop.

In areas receiving less than 20 inches of warm-season rainfall irrigation is definitely needed for sweet corn. Even in the humid Eastern States where the average annual rainfall is from 35 up to 50 inches and the warm-season rainfall is from 21 to 30 inches, growers are finding that supplemental irrigation is profitable insurance against low yields of market sweet corn. This is true especially in sections of the Atlantic and Gulf Coastal Plains that have soils with a low water-holding capacity. On such light soils, sweet corn should receive, for good results, the equivalent of about an acre-inch of water every week, either as rainfall or irrigation. Supplemental irrigation also appears

profitable for market sweet corn on the heavier soils in areas where rainless periods of 2 weeks or more are likely to occur. Prices normally received for corn for processing will hardly justify the cost of sprinkling equipment in the so-called humid areas having reasonably well-distributed rainfall.

Effect of Day Length

More than time and temperature are involved in the complex relations that determine varietal adaptations to different regions. Small early varieties developed for the North are not as a rule recommended for the South, even for growing during cool seasons. Most such varieties are adapted to the long cool days of northern summers and do not make satisfactory growth during the short days of the southern spring or autumn. Furthermore, the earliest kinds are smaller than desired for shipping from the South. Certain distinctly southern types such as Honey June and a tropical variety USDA 34 are adapted to relatively short days as well as high temperature. When planted in the North they may grow to enormous height (8 to 10 feet) before they finally silk and tassel, too late to produce edible corn before frost. They may fail, although the length of growing season may appear ample.

SOILS

Sweet corn can be grown successfully on any kind of soil that is well drained (fig. 1) and that will produce good yields of other crops or a heavy growth of annual weeds. A deep naturally rich soil that is easy to work is preferred, but it is not essential. If it is well drained, is reasonably well supplied with water (see p. 5), can be worked satisfactorily with the ordinary implements, and is not subject to serious erosion, it will probably be worth the addition of the fertilizers or manures, or both, that may be required to make it productive.

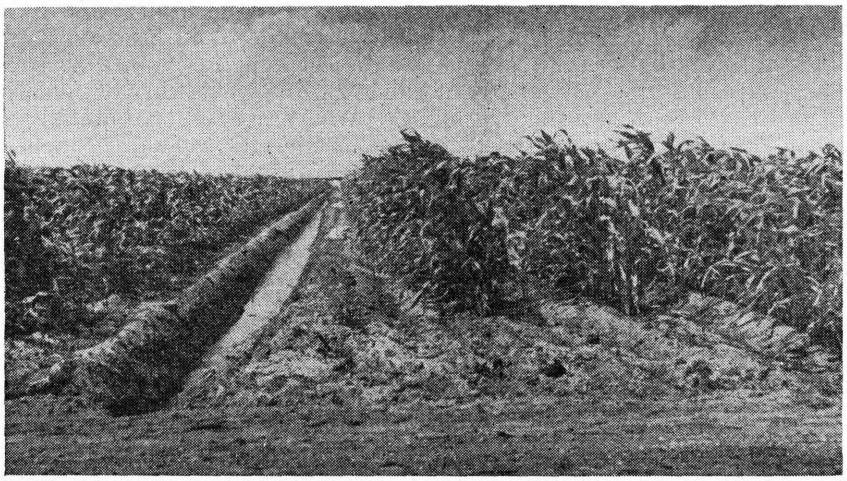

Figure 1.—*A good field of Golden Cross Bantam sweet corn on flat sandy land drained by ditches.*

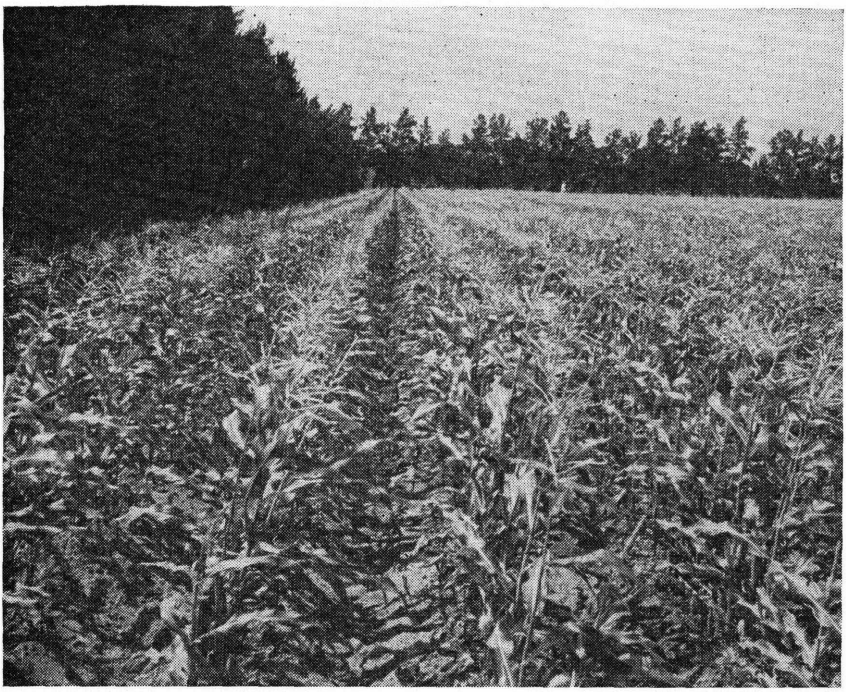

Figure 2.—*Sweet corn in a field of light sandy soil protected by a windbreak of single rows of evergreen trees.*

Sweet corn is not especially sensitive to soil acidity, but extremely acid soil needs to be limed to the point of moderate acidity. County agricultural agents and State agricultural agencies will furnish instructions on request on how to take soil samples for lime-requirement tests and where to send the samples for testing.

For early-market sweet corn it is important that the soil be rather loose and light so that excess moisture will not be retained and it will warm up early in the spring; also, the exposure should be one that is warmed early by the sun. For crops for later market or for processing these features are unimportant except near the northern limit of culture, or at relatively high altitudes where the growing season is short. Soils subject to wind erosion should be protected by windbreaks (fig. 2).

SOIL MANAGEMENT

It is not generally understood that the soils of many important agricultural areas today are more fertile than they were generations or centuries ago. Good farming practices do not merely maintain fertility, but they actually build good soils out of fair soils, and better soils out of good ones (fig. 3).

Erosion should be prevented by plowing and planting on the contour if the land slope requires this; by keeping the soil surface pro-

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Figure 3.—*Chopping sweet corn stover into the surface soil immediately after harvest of an early-spring crop in the South.*

tected with close-growing crops as much of the time as feasible; by working organic matter into the surface to permit water penetration and lessen runoff; by such devices as strip cropping or terracing on the steeper slopes that need such measures. Detailed publications on specific soil-conserving practices are available from most State agricultural experiment stations and from the Office of Information of the United States Department of Agriculture, Washington 25, D. C. County agricultural agents should be consulted for local recommendations.

Sweet corn fits well into a wide variety of diversified cropping sequences or of systematic crop rotations on general farms, truck farms, and market gardens. Sweet corn or field corn should be grown only once in 3 or 4 years on a particular field. On farms producing livestock or dairy products sweet corn is grown effectively in rotation with hay, pasture, small grains, or legumes, preferably after some crop other than sod. After sod, wireworm injury to sweet corn is sometimes relatively heavy.

In districts where large acreages of vegetables are grown for processing, sweet corn fits into rotations or diverse crop sequences that include such crops as beans, lima beans, peas, tomatoes, pumpkins or squash, cabbage, potatoes, or one or more of the farm crops mentioned in the preceding paragraph. In dairy-farming districts especially, sweet corn and some other crops for processing fit into the general

scheme. Sweet corn factory wastes and stover are used efficiently as cattle feed, and the manure is valuable in improving soil productivity.

Good truck farmers diversify their crop sequences and avoid growing any one crop too often on a particular field, but generally they are less inclined to adhere to definite rotations than operators of livestock or general farms. Rapidly changing market prospects or conditions and the effects of pests or weather often justify quick changes in cropping plans. The crops grown for fresh market in addition to sweet corn on individual truck farms differ greatly from one part of the country to another. Some growers produce only a few crops, and the same few year after year; other growers produce many vegetables each year or may shift from one group of crops to another at intervals of a few years.

Since the best rotation or crop sequence involving sweet corn depends upon many different groups of factors on different kinds of farms in various parts of the country, it becomes a problem that must be worked out virtually for each farm. Therefore, no specific rotations or crop sequences are suggested. It is probably the proper diversity of crops rather than any specific order within a hard-and-fast rotation that is important in sustaining crop yields.

COVER CROPS AND GREEN MANURES

A green manure crop or cover crop of small grain or a hardy legume suited to the locality and season should be sown at the last cultivation of sweet corn grown for harvest in the summer or early autumn. Early spring crops in the South may be followed by a green manure crop of a large-growing summer legume. Whatever the crop sequence, a green manure crop should be grown every year or two unless 5 to 10 tons or more of manure per acre is available at similar intervals. Heavy natural weed cover may help serve the same purpose if plowed down before the weeds go to seed. In any event the soil should be kept covered to prevent erosion and reduce leaching.

Some usually satisfactory winter cover or green manure crops for various regions and seasons are:

NORTHERN STATES.—Rye or wheat sown at 1½ to 2 bushels per acre at the last cultivation of sweet corn.

MIDDLE STATES.—Rye or wheat sown at 1½ to 2 bushels per acre in September or October; rye and hairy vetch mixed (1½ bushels of rye and 1 peck of vetch per acre), sown in late August or early September; or crimson clover sown at 20 to 25 pounds per acre from August to October in the States along the Atlantic coast. Crimson clover requires a well-prepared seedbed.

SOUTHERN STATES, after spring sweet corn.—Cowpeas or soybeans sown at 1½ to 2 bushels per acre after harvest; or crotalaria sown at 15 to 20 pounds per acre in a well-prepared seedbed.

SOUTHERN STATES, before spring sweet corn.—Hairy vetch or smooth vetch sown at 20 to 30 pounds per acre in September; Austrian Winter peas sown at 30 to 40 pounds per acre in September; or crimson clover or sourclover sown at 15 to 20 pounds per acre or Southern burclover sown at 50 to 60 pounds in September.

FLORIDA AND DISTRICTS NEAR THE GULF OF MEXICO.—Hairy indigo as a summer legume sown at 6 to 10 pounds per acre in March or April; or lupine for winter culture sown at 60 to 90 pounds per acre in October and November.

FERTILIZERS

Commercial fertilizers, either with or without manure, will produce profitable increases in yields of sweet corn on most soils when well chosen and suitably applied. In general, moderate applications of fertilizer supplemented by 10 to 12 tons of manure per acre are more profitable than heavy applications of fertilizer alone or manure alone. Since stable or barnyard manures contain relatively less phosphorus than nitrogen and potash, manure should be supplemented with the equivalent of about 40 pounds of superphosphate per ton, especially when no other fertilizer is used.

Fertilizer recommendations for sweet corn differ from State to State and for different soils or districts within some States. A few typical examples follow:

On the very light sandy soils of the Atlantic and the Gulf Coastal Plains and similar soils elsewhere, heavy fertilization is needed and relatively more potash is required than on less sandy mineral soils. The mixed fertilizer should contain 4 to 5 percent nitrogen, 7 to 8 percent phosphoric acid, and 6 to 7 percent potash, or a higher concentration of these substances in similar proportions. Before planting, for example, it is recommended that 1,000 to 1,200 pounds per acre of 4–8–6 be broadcast and worked into the soil. Top dressings of 150 to 200 pounds per acre of the same fertilizer are applied when the sweet corn is about 8 inches high and again at about 15 to 18 inches in height. These high rates of fertilization are used only where little or no manure is available. On less extremely sandy soils about 800 pounds per acre of 6–8–4 or 5–10–5 fertilizer applied before planting and followed by a top dressing with 300 pounds of sodium nitrate or 150 pounds of ammonium nitrate per acre when the corn is knee high is recommended.

For the majority of sweet corn growing districts, recommendations specify 5–8–5, 5–10–5, or mixtures of higher analysis having similar proportions of nitrogen, phosphoric acid, and potash. On sandy loams and other soils of moderate fertility these mixtures are recommended both with and without manure, but smaller amounts are needed with manure. On the more fertile soils, such as good loams and silt loams lower proportions of nitrogen and potash—such as a 4–12–4 or even a 4–16–4 mixture—are recommended when manure is applied. If about 15 tons of manure per acre is applied to moderately fertile soils, only superphosphate at about 500 pounds per acre may be needed to supplement the nitrogen and potash in the manure. When using any of these mixtures a top dressing of about 100 pounds of ammonium nitrate, 200 pounds of sodium nitrate, or 150 pounds of sulfate of ammonia per acre is recommended, to be applied when the corn is knee high.

On muck and certain other soils that are low in potash but not very low in nitrogen, 3–8–10 fertilizers are commonly used at 600 to 1,000 pounds per acre.

Recommendations on quantities of fertilizer to apply per acre vary widely. By far the greatest amounts per acre are used on the sandy

soils of the Southeast, as specified above. In the Northeast 600 to 800 pounds per acre of 5–8–5 to 5–10–5 mixtures broadcast and 400 to 500 pounds in band application are most common; for only moderately fertile soils or for very intensive culture, applications as high as 1,000 pounds of 5–10–5 or equivalent are desirable. In the more fertile valleys of the West and Pacific Northwest and on the better soils of the Corn Belt, recommendations range from 300 to 500 pounds per acre of above mixtures with manure and 400 to 700 pounds without manure, preferably applied in bands at planting.

Plenty of available plant nutrients in the soil is especially important early in the life of the corn plant. Sweet corn must make a rapid uninterrupted start if it is to make a thoroughly satisfactory yield.

Band applications are made with a combination planter and fertilizer distributor that places the fertilizer in bands about 2 inches to the sides of the rows of seed and about an inch deeper than the seed.

Broadcast applications of fertilizer are usually put on the soil after plowing and worked in by disking and harrowing. Applications before plowing or on the furrow bottoms during plowing have not uniformly given as good results as the more conventional applications.

The amounts of fertilizer that can be profitably applied per acre depend not only on the fertility of the soil but to a large extent on the water available for the crop and on the number of plants to the acre. It must be emphasized that if heavy fertilization is to be most profitable there must be a thick stand of uniform plants and plenty of water for that large number of plants. It is practical to push the productivity of a single stalk of corn only so far. Heavy fertilization will yield greater returns with sweet corn if the fertilizer is used to support a large number of reasonably productive plants per acre than if one tries to produce only a moderate number of superlatively productive plants. The section on planting rates on page 12 is especially important in this regard. With the maximum numbers of plants recommended per acre the maximum rates of fertilizing recommended will not be excessive. With too few plants per acre the heavy rates of fertilizing are likely to be wasteful.

SOIL PREPARATION

It has been emphasized on page 9 that cover crops or green manures should precede sweet corn whenever feasible. Such crops or old crop remains should be plowed under deeply and the soil disked 3 or 4 weeks before planting. This allows time for partial decomposition of the material so that it will not interfere with the final preparation of the soil or with the operation of the planter. Moderately heavy to heavy soils that are not subject to erosion may be plowed in the fall and left rough over winter; such soils can be worked and planted earlier in the spring after they have been plowed in the fall than if plowed in the spring. Light soils that are subject to leaching and all soils subject to erosion should be kept covered over winter and plowed in early spring.

A full stand of uniform plants is necessary for the best yields and for uniformity of quality in the harvested crop. To obtain the desired uniform stand, a deep, firm, uniform seedbed that is free of clods, trash, and surface irregularities must be prepared. Clods, trash, and irreg-

ularities interfere with proper placement of seed and fertilizer and cause irregular emergence and stand of seedlings. The soil should be disked and harrowed often enough before planting to keep weeds under control and to get the soil into condition for effective operation of the planter. In irrigated districts the final preparations before planting depend on the local irrigation practice.

PLANTING

Time of Planting

Since sweet corn is a warm-weather crop it should be planted only after the soil has become warm and there is little or no danger from frost. In general the first plantings may be made 10 days to 2 weeks after the average date of the last killing frost. Market gardeners who strive for the earliest market may plant a part of their acreage a few days to a week earlier than indicated here if the weather appears favorable. There is some risk of poor germination, retarded growth, and even severe injury or killing of seedlings by too low temperature following such early plantings. For a market crop, however, it is generally worth the risk to plant part of the acreage early. If the warm weather continues, several days' earliness may be gained at a considerable profit. If weather is so cool as to cause injury, another planting is made promptly.

For processing and for the main market crop the planting is done at a safe date, after the so-called frost-free date.

To spread the harvest range over a period of weeks, two methods are used: (1) Successive plantings at intervals of about a week or (2) planting at one time several varieties—early, medium, and late—having a wide range of time from planting to harvest. In the South the best adapted varieties are not greatly different in their time to harvest, so that successive plantings are the better way to get a range of harvests for "out-of-season" shipments northward. In the middle part of the country either method may be used with some success. In the more northerly States the simultaneous planting of several varieties having a range of time to harvest is preferred, because the later plantings of early varieties are less productive than early plantings of late varieties. The season, however, is not long enough in the North to permit a wide range of dates for planting late varieties.

Seed Treatment

For instructions on seed treatment see the section on Diseases, p. 27.

Rates and Systems of Planting

Very heavy fertilization may be profitable on plantings with large numbers of plants per acre, but it is not on plantings having what was formerly considered as moderate numbers. Rates of planting, as well as rates of fertilizing, have been markedly increased since 1940. Heavy rates of planting require heavy fertilization. Neither will be effective without the other. If the maximum rates of planting as suggested here are used, the maximum rates of fertilizing recommended on pages 10 to 11 will usually be needed.

There is now less general preference for the check-row system of planting than formerly. With the development of more effective machinery and of chemicals for weed control there is less need for cross cultivation to control weeds. In growing sweet corn for processing the increasing use of mechanical harvesters favors planting singly in drills rather than in hills of three or four plants because the harvesters operate better on the single plants in drills. Growers of market sweet corn also prefer drills to hills.

Before 1940 from 8,000 to 10,000 plants of a medium-sized sweet corn variety per acre was considered a good number, provided the stand was uniform. Now, however, in few districts are 10,000 to 12,000 plants considered enough for the most effective use of land, labor, and facilities that are required to grow most varieties. Current recommendations run as high as 16,000 to 17,000 plants per acre of medium-sized varieties such as Golden Cross Bantam, and 20,000 plants or more of the small, early varieties. These rates require about 12 to 14 pounds of seed per acre.

In the suggested spacings listed below for drilled corn the first figure refers to the distance in inches between rows, and the second figure to distance between single plants in the row. See the section on varieties (pp. 23 to 26) for information on plant sizes.

For very small, very early varieties: 30 by 8, or 30 by 9 inches.
For small, early varieties: 30 by 10, 32 by 10, or 32 by 12 inches.
For medium-sized varieties: 32 by 12, 32 by 14, or 36 by 12 inches.
For large varieties: 36 by 14 or 40 by 12 inches.
For very large, late varieties: 42 by 12 or 42 by 14 inches.
For hills in check rows three or four plants per hill are best, with the hills about 32 by 32 inches for small varieties, 36 by 36 for medium, and 40 by 40 inches for large ones.

Local recommendations vary, but for the most part they are within the ranges suggested. Some experience will be necessary to determine the maximum profitable rate of planting in a given field.

Seed Size and Planter Plates

Too much stress can hardly be placed upon the importance of precise planting of enough good seed in properly prepared soil to produce a full stand of uniform plants. To plant precisely the desired quantity of seed it is necessary to have (1) a dependable planter with plates designed for the desired rates of planting and (2) sweet corn seed that has been "sized," or graded for uniformity of sizes, each size to be planted with the appropriate planter plate.

No planter can drop ungraded seed uniformly, because a planter plate with holes of a particular size will deliver more small seeds than large ones. Bags of graded seed are marked with the size of planter plate to be used with the seed. If a grower of a large acreage buys several bags of seed, they probably will represent a range of sizes but the seed in one bag will be of one size. To plant at a constant rate, the correct planter plates must be used for each size of seed.

Small plantings for market rarely require sized seed, but for large plantings that are to be grown and harvested on schedule for market or for processing sized seed and accurate planting plates for each size

are important. Through improvement of uniformity of growth and development, a product of more uniform quality can be harvested.

Depth of Planting

Planting too deep is a common error. Seed of sweet corn, as of other crops, should be planted only deep enough to place it in moist soil that lies below the dry surface layer. In loamy, silty, or other heavy soils the depth should be not more than 1 inch, although the soil at that depth may appear somewhat dry at planting time. Planting much deeper may interfere with germination and emergence if hard rains pack or crust the soil before emergence. In sandy loams 1½ inches is a good depth. In very light or sandy soils that dry out quickly and that are not packed by rains, the seed should be placed about 2 inches deep to help insure that the soil will be moist enough to promote prompt germination. Seedlings can push through 2 to 2½ inches of very light soils without harm.

Replanting

Plants that start growth much later than adjacent plants in the row or hill rarely, if ever, catch up with the early ones. The larger plants tend to crowd the laggards so that they will continue to lag and remain relatively or entirely unproductive. For this reason it is rarely, if ever, worth while to replant the "skips" or missing hills by hand after the sweet corn is up and growing. An entirely missing hill of three or four plants causes more loss in yield than one plant missing from each of three or four hills. Where plants are close together those that grow normally tend to make up part of the loss of the missing plant. A single skip in a drill row causes more loss than a missing plant in a hill in which two or three plants remain.

These facts are presented here to emphasize again the importance of precise planting to get a full, uniform stand of plants and to point out the futility of trying to "patch up" a poor stand. If a stand is very poor for any reason it is usually wiser to replant entirely than to spend the costs of production on an inadequate number of plants per acre or on a stand of plants of mixed ages and sizes.

IRRIGATING

Supplemental Irrigation

In the eastern half of the country there is usually enough moisture in the soil at planting time, together with the rainfall of the following weeks, to produce normal growth of sweet corn up to the silking stage. After that time rainless periods in about half of the years are likely to be long enough to interfere with growth on light soils of low moisture-holding capacity.

In the relatively dry years applications of an inch of water per acre following each rainless week increases yields substantially. In experiments with such irrigation to supplement natural rainfall the increases in yield were much greater on soils well supplied with organic matter than on those low in organic matter. The percentage of marketable ears was also higher. Manure and heavy fertilization give greater increases in yield when ample water is available than when it is short.

Since irrigation is not needed every year in the Eastern States, a permanent irrigation system will hardly be justified for growing sweet corn. Portable sprinkler systems that can be moved from field to field, however, appear profitable as a way to reduce loss from dry weather. Of course, a cheap and dependable supply of water must be available close to the field. Many factors must be taken into account in determining the probable profitableness of such irrigation.

Sweet Corn in Irrigated Districts

Sweet corn is becoming more popular as a crop in the irrigated districts of the West, and it produces very high yields under good management in favorable locations. Irrigation practices may differ widely from one district to another, according to source of water, character of soil and slope, and other crops generally grown in the cropping system. No effort, therefore, is made here to outline details of the methods used in various places.

Regardless of the surface methods used, it is generally recommended that at each irrigation small streams be run in the furrows until the water soaks down to a depth of 1½ to 2 feet. A few thorough soakings are preferred to frequent light applications.

FIELD CARE OF THE CROP

Suckering

Experiments in both the East and the West show that the removal of suckers, or tillers, from sweet corn plants is, at best, a waste of labor. In the Eastern States delayed suckering has actually reduced yields, and the later the removal—up through tasseling time—the more serious the reduction in yield. Some experiments in the West have shown no such harmful results but, nevertheless, showed that suckering is an unprofitable practice.

Cultivating

The main purpose of cultivation is to control weeds. If no chemicals are to be used in weed control, cultivation often needs to be started before the corn has emerged or about the time of emergence. The rotary hoe can be used effectively to break up a crust that has formed on the soil surface before the plants emerge. A spike-tooth harrow, with the teeth adjusted nearly flat, can be used with little or no injury to the seedlings. Either the rotary hoe or spike-tooth harrow can be used to stir the surface soil and kill small weeds until the corn is about 5 inches high.

Since many of the corn roots are near the soil surface all cultivation must be shallow except in the "middles" between the rows while the plants are small. Weeds in the row are most difficult to destroy without injuring the sweet corn. Modern cultivating equipment is widely available, however. A skilled workman can adjust and use such equipment to kill nearly all weeds without resorting to hand hoeing. For effective weed control by machine cultivation, without injuring some of the sweet corn plants, the rows must be planted with unvarying distance between them and with no wavering from side to side.

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Sweet corn should be cultivated often enough to destroy the weeds while they are small. The soil must not be cultivated after a rain or irrigation until it is dry enough so that a ball of it pressed firmly in the hand will crumble readily when broken. It is generally best to cultivate as soon after a rain as the soil reaches this stage of dryness, or soon thereafter. There is no point in cultivating if there are no weeds to be killed. Cultivation of heavy soils should not, however, be delayed so long after a rain or irrigation that the soil becomes baked, crusted, or otherwise hard to work.

Chemical Weed Killers

Chemical weed killers are potent substances that will damage or destroy many kinds of crop plants as well as weeds if the chemicals are allowed to come in contact with the crop plants. Each chemical must be used with strict attention to all precautions against crop injury. Drift of spray or dust has accidentally damaged crops adjacent to treated fields; this must be guarded against carefully. Contamination of spraying or dusting equipment with some weed killers is very difficult to remove. Traces of weed-control chemicals remaining in equipment that is also used for applying fungicides and insecticides have often injured the crops when sprayed or dusted for insect or disease control. Some weed-killing chemicals are poisons, and all should be handled with care.

Although chemical weed control in row crops is still in the experimental stages, a few recommendations appear safe for sweet corn. The sodium salt of 2,4-D and the amine of 2,4-D are probably the best killers of broadleaved weeds to use in sweet corn fields. The volatile esters of 2,4-D are not recommended. Sweet corn is sensitive to 2,4-D at certain stages of growth, and some varieties are more susceptible to injury than others. It is thus necessary to know that a given dosage will be tolerated by a particular variety and at what stage of growth to apply the treatment. The more rapidly the plants are growing, the greater is the danger of injury by the weed killer.

A preemergence application of 1½ pounds per acre of 2,4-D acid equivalent, except on sandy loam or lighter soils, will usually control annual grasses and certain broadleaved weeds for 5 to 7 weeks. This preemergence treatment should not be used on sandy loam or lighter soils, because of the danger of injury to the sweet corn by too deep penetration of the chemical. There is little danger of too deep penetration of soils heavier than sandy loams.

Spraying of the weeds when the corn is 6 to 10 inches high has generally given a better kill of broadleaved weeds, with less injury to the sweet corn, than earlier or later applications. Although broadleaved weeds are easily killed with 2,4-D, some of the weedy grasses are as resistant as corn and so cannot be controlled successfully by postemergence applications. If the sweet corn field is grassy, mechanical methods of control must be used.

The following dosage is recommended for killing broadleaved weeds in sweet corn 6 to 10 inches high: One-half pound of 2,4-D equivalent per acre in the form of the sodium salt or of the amine of 2,4-D, applied in 5 gallons or more of water. The spray should be delivered with nozzles that give a flat spray, directed toward the rows of corn,

close to the ground to keep it off the sweet corn leaves as much as possible and still obtain full coverage of the weeds.

After killing the weeds by spraying with a weed killer the soil should not be cultivated for 2 to 3 weeks, because cultivating will bring another lot of weed seeds near the surface where they will promptly germinate, necessitating another spraying or a cultivation soon. Only one or two cultivations should be required in addition to the chemical treatments. *If cultivation is necessary after spraying with 2,4-D it should be delayed at least 8 to 10 days after spraying* because 2,4-D makes sweet corn plants brittle and very susceptible to mechanical injury for several days. The plants normally recover from this effect in about a week.

It is emphasized that chemical control of weeds in a row crop requires good equipment that is carefully adjusted and in good operating condition. It requires skill and attention to every detail. Special care is necessary in calibrating the spray nozzles to deliver the proper amount of solution and size of droplet of spray; also in gaging the tractor speed to conform to the rate of spray delivery so that the correct amount of chemical per acre will be applied uniformly in the right place. An unprepared or careless operator can do much harm.

HARVESTING

Time of Harvest

Regardless of the method of harvest or whether the sweet corn is grown for processing or for market it should be harvested when the kernels are in the milk stage. At this stage the silks are brown and dry beyond the end of the husks and the kernels have developed enough size for the ear to fill the husks snugly well out toward the tip. The husks feel tightly fitted about the ear. The kernels are almost as large as they will become, but they are still soft, tender, and are filled with a thick, opaque, milky juice. As in judging the best stage of development for harvesting of many other crops, some trial and error and some experience are necessary.

At the best stage for eating, sweet corn kernels contain about 5 to 6 percent of sugar, 10 to 11 percent of starch, and 70 percent water.

As indicated in the section on climatic requirements, some processing companies use rather elaborate instruments and calculations to take as much of the guesswork as possible out of the problem of judging the best harvest stage. Such methods are especially useful in scheduling extensive operations and in harvesting a product that must meet rather strict standards of uniformity and composition.

Although high quality is no less desirable in market sweet corn than in processed sweet corn, minor variations in stage of development of ears for market are less noticeable and less objectionable than they are in processed products. Market sweet corn, therefore, is commonly harvested only on the basis of appearance of the ears and the kernel contents.

If the ears are harvested when the kernel contents are thin and watery or only cloudy or translucent instead of a thick white liquid, the edible portion per ear will be low and it will lack the desired rich body and flavor. If harvest is delayed until the kernel contents become semisolid or doughlike, most of the sweetness will be gone and

the skins, or coats, of the kernels will be tough. Fortunately, the best quality occurs at the time when the largest yield of fresh kernels is obtainable. Delaying harvest beyond the best stage will not give any worthwhile increase in weight of edible corn. Beyond that stage the kernels and entire ear begin to lose water about as fast as more solid matter develops, and loss of eating quality is rapid.

In learning to judge proper maturity from exterior appearance and "feel," it will be helpful to husk several ears and to examine the kernel contents upon pushing the thumbnail into a few kernels. The husks should not be pulled away from the kernels of ears that are to be marketed in the husk. Ears should not be "explored" in this way and left on the plant for later harvest, because exposure of the kernels subjects them to injury and lowers their quality. With some experience, a picker learns to distinguish on sight most ears that are ready for harvest. Upon grasping the ear to break it from the stalk, the "feel" of immaturity will reveal some ears that are not quite ready for harvest, although, at a glance, they appeared ready.

Methods of Harvesting

Before 1949 sweet corn was harvested only by hand. Since 1940 there have been rapid developments in the design of mechanical sweet corn pickers. Some commercial acreage for processing was harvested mechanically in 1949 and 1950. A large share of the acreage for processing doubtless will be so harvested from 1952 on. Most of the sweet

Figure 4.—*Hand harvesting of sweet corn for fresh market. Ears from six rows are tossed into the tractor-trailer that delivers the sweet corn to the central packing house.*

corn for processing and all that for market, however, was harvested by hand in 1951.

In hand harvesting the ear is grasped near its base, just above the shank, or heavy stem, that is concealed by the outer husks. It is then bent sharply downward or to one side by a rotary motion of the wrist. The object of this movement is to break the shank as close to the ear as practicable without breaking the main stalk or tearing the entire shank from the main stalk. At first the other hand may be needed to hold the stalk or the shank, but with practice the ears of most varieties can be snapped off properly and easily with one hand.

In small-scale operations the hand pickers drop the ears into bags or other containers that they carry to the ends of the rows and empty into other containers or into the bed of a vehicle. In large-scale operations in which a highly uniform field or planting is harvested only one time, the ears are thrown directly into a vehicle that is driven alongside of the pickers (fig. 4).

Sweet corn for processing is picked and loaded directly into the vehicle in which it is delivered to the factory. Corn for market is usually hauled to a central point on the farm or to a packing house, where it is prepared for market (figs. 5 and 6). In the Everglades of Florida mobile "packing houses" move through some fields; hand pickers put the corn on conveyors that carry it to workers who trim and pack the ears into crates. The crates are then moved by other conveyors onto trucks (fig. 7).

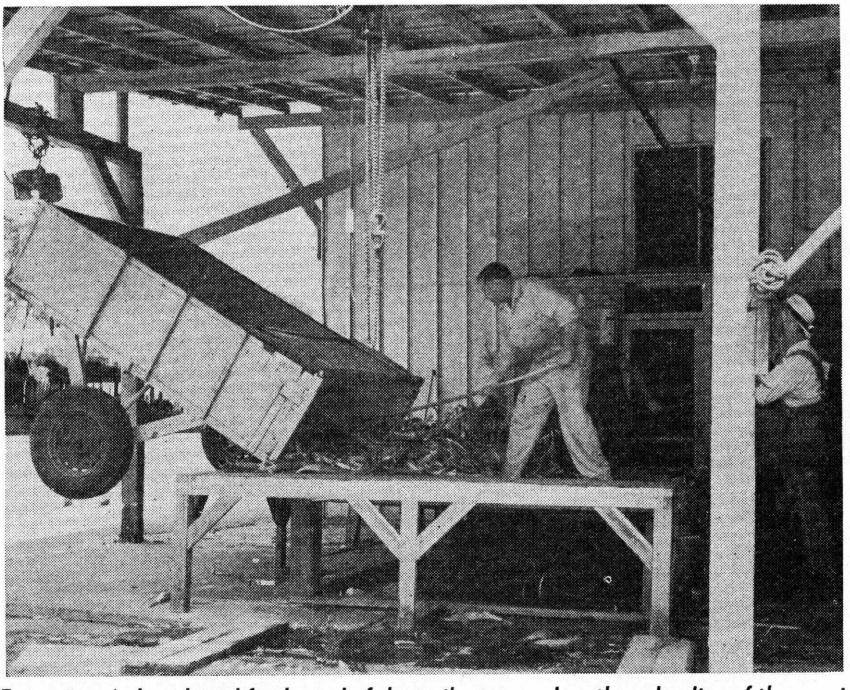

Figure 5.—*A chain hoist lifts the end of the trailer to speed up the unloading of the sweet corn at the packing house immediately after picking.*

Because of the harmful effects of high temperature on the eating quality of sweet corn, the better growers, processors, and shippers do as much of the harvesting as possible in the very early morning while both the ears and the air are cool. One advantage foreseen for the mechanical harvester is that it can be operated at night, thus taking advantage of cooler temperatures to help preserve high quality. The ears must not be left in piles or in vehicles so that they will become heated.

Since sweet corn grown under contract for the canner or freezer is harvested and handled under the direction of company fieldmen there is no point in going into detail here. It is noteworthy, however, that the mechanical sweet corn harvester is being improved each year and is being used increasingly. One skilled operator with a tractor-picker-trailer combination will harvest 50 to 60 tons in a 10-hour day in contrast to 2½ to 4 tons a day by hand. Although the machine picks culls that must be thrown out at the factory, it does not miss any good ears as hand-pickers sometimes do. In rush periods, if necessary, the mechanical picker can be equipped with lights and can operate virtually around the clock. Some machines under good conditions in good fields have picked up to 9 tons an hour—as much as 15 to 20 men normally pick in an hour.

Mechanical pickers cause some ear damage, but for processing it is not serious economically in view of the saving in labor costs. Precise

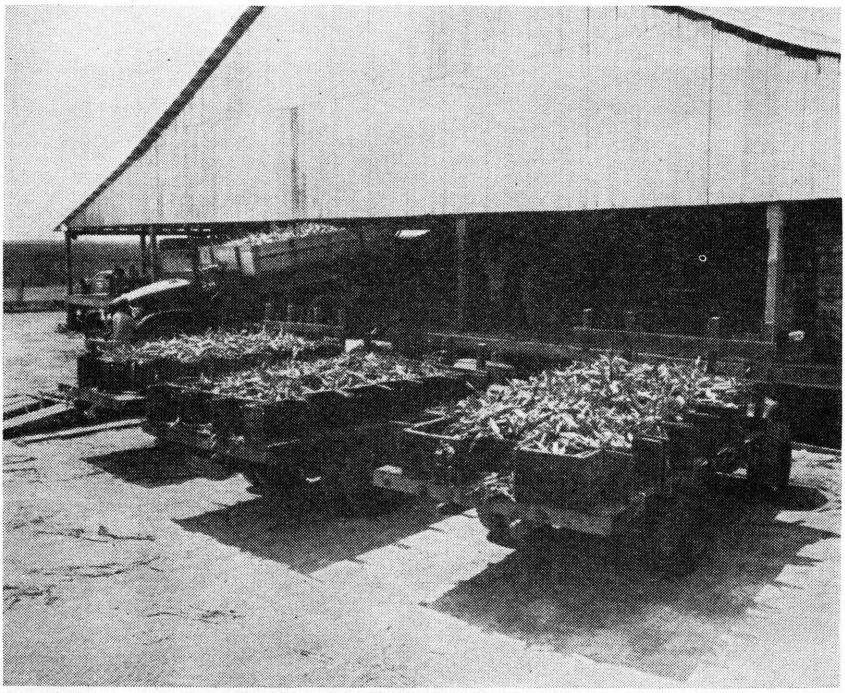

Figure 6.—*Sweet corn for fresh market hauled by truck to the packing house. Spaces for ventilation between compartments retard rise in temperature of corn that cannot be unloaded and cooled immediately.*

Figure 7.—*A mobile "packing house," or harvester, reentering the field after making a turn.*

planting and uniform growth of a uniformly maturing stock are essential for successful use of mechanical pickers. A field can be picked by machine only once because the machine mangles or cuts up the plants.

HANDLING MARKET SWEET CORN AFTER HARVEST

Sweet corn for processing normally is delivered to the factory within a few hours after it is harvested; therefore, it requires no special treatment or handling. Sweet corn for local or nearby market may be delivered to the retailer or even to the consumer with equal dispatch. Much of the market produce now, however, is shipped long distances by truck or train—1,000 miles or more—and can reach the consumer only after 2, 3, or more days. Limited quantities are shipped "out-of-season" 2,000 miles or more by air.

The longer the time between harvest and the table, the more promptly must the sweet corn be cooled and the lower the temperature at which the ears must be kept, short of actual freezing. If the corn can be harvested at the break of day, kept out of the sun, and rushed to the consumer before noon, no icing or refrigeration is usually necessary. For delivery late in the day or on a later day, the ears should be cooled promptly and kept iced or under refrigeration at 34° to 40° F. until delivered to the consumer.

Successful growers and marketers of fresh sweet corn use a variety of methods and equipment to retain quality—or at least retard its

Figure 8.—*Looking into the doorway of a railroad refrigerator car loaded with fresh sweet corn in crates. Note the snow ice over the top of the load.*

loss. It can be cooled fastest by passing through tanks or sprays of clean water that is just above freezing, or about 34° F. Forty to sixty minutes of this precooling in the husk is usually required, depending on the field temperature of the corn and the capacity of the precooling equipment. After precooling the ears are quickly packed into bags or crates, usually holding 5 dozen ears. The containers are then either promptly loaded into iced refrigerator cars or refrigerated trucks or are put under ice or refrigeration until they can be loaded for shipment.

Cars or trucks should carry enough refrigeration to keep the temperature of the corn below 45° F. until it reaches its destination. This requires standard refrigeration, together with enough top ice over the crates or snow ice between alternate layers of bags to hold to the destination. Florida shippers to New York, for example, use standard refrigeration car icing with 7 tons of top ice or snow ice per car (fig. 8).

Some growers and shippers husk and desilk the ears by machine, trim, precool for 15 to 25 minutes in water at 34° F., seal three to five pieces in a transparent film package, and then place the packages under refrigeration or ice in ventilated cartons preparatory to shipment.

VARIETIES

Some Important Changes

By 1940 the greater proportion of sweet corn for processing was grown from hybrid seed, but open-pollinated varieties were still grown commonly in the districts then producing sweet corn for market. Since World War II new hybrids adapted to the South or West have been largely responsible for large acreages of new production in several districts. Superior hybrids have also largely displaced the open-pollinated varieties formerly grown in the long-established districts of market sweet corn production. Open-pollinated varieties are still listed in current seed catalogs, but their commercial production is relatively unimportant.

A second noticeable shift in varietal preferences occurring between 1930 and 1950 has been in favor of varieties having yellow instead of white kernels. The unusually high quality of Golden Bantam, Golden Sunshine, and a few other new yellow open-pollinated varieties at the time of their introduction a generation ago doubtless speeded the shift from white to yellow sweet corn. Knowledge of the superior food value of yellow corn over white also helped to popularize yellow varieties and hybrids. Of the sweet corn seed produced in 1950, about 76 percent was yellow hybrids; 5 percent, white hybrids; only 13 percent was yellow open-pollinated kinds; and 6 percent, white open-pollinated.

Varietal Descriptions

Many public research agencies and private companies are breeding and introducing new sweet corns having higher quality, productiveness, or suitability for specific purposes or places of culture. As a result such a large number of hybrids and varieties is now listed and grown that no one is familiar with all of them. Many new kinds remain available commercially for only a few years because they are displaced by better ones. Many similar hybrids of commercial origin bear different names or identifying numbers, although some of them may have the same unidentified parents. Among certain hybrids or varieties having different names there are sometimes no greater differences in appearance or performance than there are among stocks bearing the same name. And, as mentioned in the section on climate, a single variety or hybrid may develop and behave very differently in one place than it does in another.

Because of the rapidity with which sweet corn seed stocks are being changed in man's efforts to improve them, their different behavior in different places, and the large number available from many sources, it is not practicable to give descriptions that will permit sure identification of even all the important ones. Therefore, only a few of the more obvious and important features will be listed for a number of varieties and hybrids that have appeared outstanding in one district or another (table 1).

TABLE 1.—*Some of the principal features of some sweet corn hybrids and varieties commonly grown in the United States*

Variety or hybrid	Kernel color [2]	Time to harvest	Ear length	Rows of kernels	Plant height
		Days	*Inches*	*Number*	*Feet*
SMALL TO VERY SMALL VERY EARLY KINDS, 65 TO 74 DAYS TO HARVEST [1]					
Earligold	Y	73	7	12	6
Early Surprise [3]	Y	72	7	8–12	5
Golden Early Market [3]	Y	73	6½	8–12	4½
Golden Midget [3]	Y	70	4	8	3
Golden Rocket	Y	67	7	10–12	5
Golden Sunshine [3]	Y	74	6½	10–12	5½
Marcross	Y	74	7½	10–14	5½
North Star	Y	70	6½	8–12	5½
Seneca Dawn	Y	70	7½	12–16	5
Seneca Golden	Y	72	7	12	5½
Seneca 60	Y	67	6½	10–12	4½
Spancross	Y	70	6½	10–12	5½
SMALL EARLY KINDS, 75 TO 80 DAYS TO HARVEST [1]					
Carmelcross	Y	77	7	12–14	5½
FM Cross	Y	80	7	14–16	6
Golden Bantam [3]	Y	78	6½	8	5½
Gold Rush	Y	77	7	12–14	6
Midgolden	Y	78	7½	10–14	6
Northern Cross	Y	77	7	10–14	6½
Tendergold	Y	80	7½	10–14	6
MEDIUM TO LARGE MIDSEASON KINDS, 81 TO 89 DAYS TO HARVEST [1]					
Aristogold Bantam Evergreen	Y	87	9½	16–18	7
Erie	Y	88	9	12–14	6½
Golden Bounty	Y	83	9	12–14	7½
Golden Cross Bantam	Y	85	8	10–14	6
Golden Hybrid 2439	Y	87	7½	12–16	7
Golden Security	Y	85	8	14–16	7½
Howling Mob [3]	W	83	7½	12–16	7
Huron	Y	89	9	12–16	7
Illinois Golden Hybrid No. 10	Y	86	7½	12–14	6½
Ioana	Y	87	8	12–14	6½
Kennebec	Y	82	7½	12–14	6
Lee	Y	84	7½	12–16	6½
Lincoln	Y	83	7½	12–16	6

See footnotes at end of table.

TABLE 1.—*Some of the principal features of some sweet corn hybrids and varieties commonly grown in the United States*—Continued

MEDIUM TO LARGE MIDSEASON KINDS, 81 TO 89 DAYS TO HARVEST [1]—Continued

Variety or hybrid	Kernel color [2]	Time to harvest	Ear length	Rows of kernels	Plant height
		Days	*Inches*	*Number*	*Feet*
Oto	Y	87	9	8–12	7
Seneca Chief	Y	85	9	12	6½
Top Cross Maine Bantam	Y	83	7½	12–16	6
Whipple Early White [3]	W	84	6½	14–18	6
Whipple Early Yellow [3]	Y	85	7	12–14	7
LARGE LATE KINDS, 90 DAYS OR OVER TO HARVEST [1]					
Country Gentleman [3]	W	95	7	(4)	7
Country Gentleman 8x6	W	95	8	(4)	7
Country Gentleman (Ill.) No. 13	W	97	7½	(4)	7½
Honey June [3]	W	105	8	12–18	9
Iochief	Y	90	9	14–18	7
Iogent No. 11	W	98	8	(4)	8
Iogreen	W	95	7½	20–26	8
Narrow Grain hybrid	W	95	8	(4)	8
Stowell Evergreen [3]	W	95	8	16–20	8½
Stowell Evergreen hybrid 14x13	W	96	8	14–18	8

[1] Days to harvest are the approximate number of days from planting to harvest when planted about the frost-free date in a region or season having a monthly mean temperature of 70° to 75° F. during most of the growing season. Mean growing season temperatures as low as 65° will increase the time to harvest by about 15 to 20 days for most varieties.

[2] Y indicates yellow kernels; W, white.

[3] Open-pollinated variety.

[4] Nonrowed variety.

Regional Recommendations

Variety tests of sweet corn are conducted on a rather large scale every year in many States to compare the new varieties with the old and to determine the best ones for various parts of the country. Lists of recommended varieties change almost annually, as new varieties appear and as experience with them indicates changes should be made. Table 2 indicates which of the varieties listed in table 1 appear best for growing for market in different sections of the country. The information in table 2 is based, chiefly, on tests conducted by State agricultural experiment stations through 1950.

The climate in some of the northernmost sections and in the Pacific Northwest is so cool that all varieties develop more slowly than in most other places where sweet corn is generally grown. For example, in the Upper Peninsula of Michigan nothing later than Golden Bantam can be grown. Rated as a 78-day variety under average conditions Golden Bantam requires about 100 days in that section. Later varieties encounter frost before harvesttime. In western Washington Carmelcross requires 100 to 120 days, although it is rated as a 77-day

variety; Golden Cross Bantam may require up to 130 days in some localities of the section. Such effects of climate should be kept in mind in using table 1 and table 2.

TABLE 2.—*Some sweet corn varieties recommended for growing for market in several areas of the United States, 1952*

[The later varieties adapted to an area are generally preferred because they are more productive than equally adapted early varieties]

Area	Some varieties recommended
Extreme southeast	Golden Cross Bantam, Ioana, Aristogold Bantam Evergreen, Illinois Golden Hybrid No. 10,[1] Golden Security, Erie.
Middle South	Aristogold Bantam Evergreen, Golden Cross Bantam, Ioana, Golden Security, Golden Hybrid 2439, Illinois Golden Hybrid No. 10, Erie.
Texas	Ioana, Aristogold Bantam Evergreen, Golden Cross Bantam.
Middle Atlantic	Carmelcross, Aristogold Bantam Evergreen, Golden Cross Bantam, Ioana, Iochief, Golden Security, Stowell Evergreen hybrid, Country Gentleman, and Country Gentleman hybrids.
Northeast [2] [3]	Marcross, Carmelcross, North Star, Northern Cross, Golden Rocket, Golden Cross Bantam, Ioana, Seneca Chief.[4]
Corn Belt [3]	Same as for northeast area.
North Central [5]	Spancross, Marcross, Carmelcross, Golden Rocket, Gold Rush, Golden Cross Bantam, Ioana.
Northernmost central and northeast.	Only small, early, varieties are suitable. Nothing later than Golden Bantam (*not* Golden Cross Bantam) is recommended. See table 1. Note: All varieties are 2 to 3 weeks later than in warmer parts of the country.
Western "intermountain." [5]	Marcross, Carmelcross, Seneca Golden, Golden Cross Bantam, Ioana, Illinois Golden Hybrid No. 10.
California	Golden Cross Bantam, Ioana, Seneca Chief,[4] Marcross, Carmelcross.
Pacific Northwest	Spancross, Golden Rocket, North Star, Carmelcross, Seneca Chief,[4] Golden Cross Bantam, FM Cross. Note: All varieties 2 to 3 weeks later than in warmer parts of the country.

[1] Especially in the Everglades.
[2] Varieties for West Virginia are in this group rather than in the Middle Atlantic group.
[3] The earlier varieties shown are better adapted for the cooler districts of the area.
[4] Chiefly for home use and local market.
[5] The later varieties are adapted to the warmer parts of the area.

DISEASES [1]

Root rots cause great losses in sweet corn, especially in the field corn regions. Infection of a crop may occur from diseased seed or from soil that contains the organisms. In either case reduced yields, irregular growth and maturity, barren stalks or stalks bearing nubbin ears, and plants that die prematurely result. Experimental work shows that the infection of seed may be considerable, and disease-free ears should be selected for seed. If there is any question as to freedom from disease, the seed should be treated, using the Arasan or Phygon slurry treatments recommended for corn seed treatment in United States Department of Agriculture Miscellaneous Publication 219, Treat Seed Grain (revised, 1949). Rotation of crops and the maintenance of a highly fertile condition of the soil will keep down to some extent the amount of damage if the soil becomes infested.

Smut is a widely distributed disease, attacking the stalks, ears, and tassels of the sweet corn plant. The organism produces irregular galls, or outgrowths, covered at first with a white membrane, but later these break open and scatter masses of black spores. The smut fungus will infect at any actively growing point or fresh wound on the plant at any period during the growth of the crop. Treatment of the seed to prevent smut is ineffective. Rotations should be practiced, and land should not be top-dressed with manure or refuse matter produced from the feeding of smut-infected corn stover to livestock.

Ear rots are caused by several fungi and produce imperfectly developed ears that are soft and often covered with a mold. The ear rots, which usually appear later in the season, are important chiefly where sweet corn is grown for seed. They are more serious in moist, warm weather. Control measures include rotation, clean cultivation, and the use of disease-free seed of disease-resistant strains.

Bacterial wilt, or Stewart's disease, of sweet corn formerly occurred every year in the Middle Atlantic States. After a series of mild winters the disease occasionally caused serious losses. The bacteria live over winter in one of the corn flea beetles and are carried to the young corn plants upon which the beetles feed. Throughout the season the beetles spread the disease by carrying the bacteria from diseased to healthy plants. Long, light-yellow streaks develop in the leaves, and bacteria fill the vessels, or water-conducting fibers, of the stalk and ooze out as yellow beads from the cut ends. Plants may wilt and die or remain stunted, develop premature tassels, and bear nubbins or no ears at all. Golden Bantam and other early varieties are most susceptible. The development and use of resistant hybrids and strains has reduced losses caused by bacterial wilt to a minimum. Resistant hybrids and strains include Golden Cross Bantam, Marcross, Whipcross, Spancross, and Ioana, developed in cooperative studies by the United States Department of Agriculture and the State agricultural experiment stations, by the State stations

[1] Prepared by A. G. Johnson, collaborator, formerly principal pathologist, Charlotte Elliott, formerly pathologist, and Alice L. Robert, associate pathologist, Division of Cereal Crops and Diseases, Bureau of Plant Industry, Soils, and Agricultural Engineering.

themselves, and by other agencies. The use of these hybrids offers substantial control.

A leaf blight caused by the fungus *Helminthosporium turcicum* is sometimes severe on sweet corn. The fungus is not seed-borne but is carried by the wind from infected crop residues. No resistant varieties are known. Several other leaf diseases of minor importance also occur.

For detailed information concerning these or other diseases, write to your State agricultural experiment station or to the Plant Industry Station, Beltsville, Md.

INSECTS [2]

Many species of insects attack sweet corn and cause damage that reduces materially the yield and quality of the product. Among the more important insect pests are the corn earworm, the European corn borer, common cornstalk borers, webworms, the armyworm, the army cutworm, the fall armyworm, the chinch bug, the corn flea beetle, the corn leaf aphid, the corn root aphid, white grubs, the Japanese beetle, leafhoppers, grasshoppers, wireworms, the seed-corn maggot, and the southern corn rootworm.

Sweet corn can be protected from the earworm by spraying with DDT (fig.9). To prepare the spray make an emulsion by mixing 3

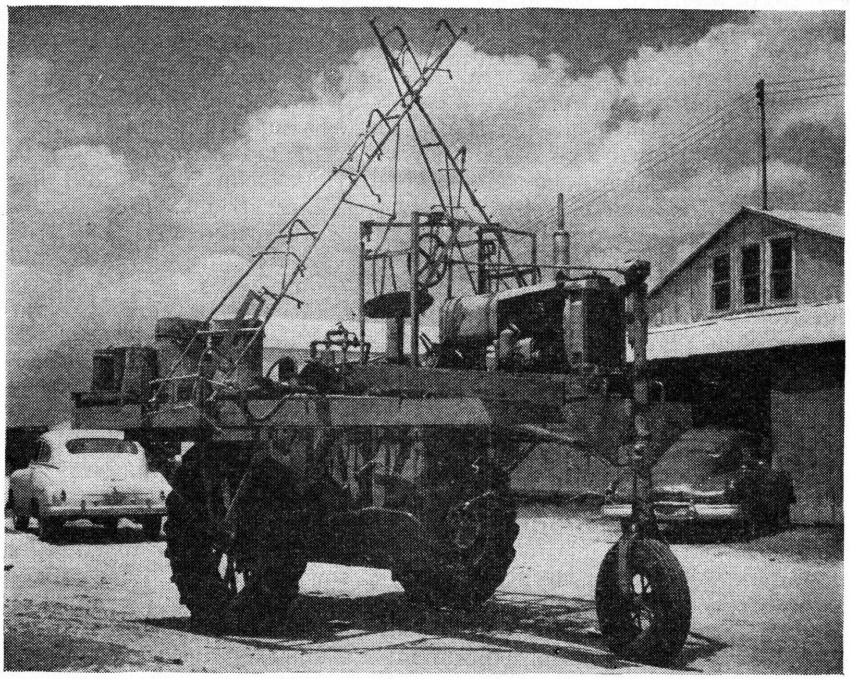

Figure 9.—*A 10-row power sprayer for insect control in sweet corn. The spray booms are raised to permit driving the machine to the field.*

[2] Contributed by the Division of Cereal and Forage Insect Investigations, Bureau of Entomology and Plant Quarantine.

quarts of 25 percent DDT emulsifiable concentrate (obtainable commercially) and 2½ gallons of white mineral oil (65 to 95 seconds Saybolt viscosity) thoroughly with water to make 25 gallons. For a smaller quantity use ¼ pint of the DDT concentrate and ¾ pint of the oil with water to make 1 gallon. Apply the spray to the ears 1 day after the silks appear and again 2 days later. A third application 2 days after the second usually increases the control. Spray only enough of the mixture onto the silks to wet them; 25 gallons is enough for 1 acre of corn, and 1 gallon for a plot about 17 by 100 feet.

A spray similarly prepared, but including only 1¼ gallons of mineral oil in a 25-gallon lot, can be applied to the entire plant to reduce "budworm" damage by the earworm before the sweet corn reaches the tasseling and silking stage.

Warning: **Because of the danger of poisonous residues, do not feed husks or other parts of corn plants that have been treated with DDT to dairy animals or to meat animals being finished for slaughter.**

The European corn borer in sweet corn can be controlled with sprays or dusts containing DDT or ryania. For information on dosages and timing of the applications, as well as on the control of other insects that infect sweet corn, consult your county agent, your State agricultural experiment station, or the Bureau of Entomology and Plant Quarantine, United States Department of Agriculture, Washington 25, D. C.

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